

# Stat 341 Lecture 3

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2017-01-18

Control Flow

Reading from and writing to files

## Control Flow

## if and if-else

- ▶ if tests a condition and executes code if the condition is true. Optionally, can couple with an else to specify code to execute when condition is false.

```
if("cat" == "dog") {  
  print("cat is dog")  
} else {  
  print("cat is not dog")  
}
```

```
## [1] "cat is not dog"
```

# for loops

Example:

```
n <- 10; nreps <- 100; x <- vector(mode="numeric",length=nreps)
for(i in 1:nreps) {
  # Code you want to repeat nreps times
  x[i] <- mean(rnorm(n))
}
summary(x)
```

```
##      Min.   1st Qu.   Median     Mean   3rd Qu.     Max.
## -0.70120 -0.23650 -0.02673 -0.01709  0.17750  0.97120
```

```
print(i)
```

```
## [1] 100
```

## for loop index set

- ▶ Index sets of the form 1:n are most common, but can be almost any atomic vector.

```
ind <- c("cat", "dog", "mouse")
for(i in ind) {
  print(paste("There is a", i, "in my house"))
}
```

```
## [1] "There is a cat in my house"
## [1] "There is a dog in my house"
## [1] "There is a mouse in my house"
```

# while loops

- Use a while loop when you want to continue until some logical condition is met.

```
set.seed(1)
# Number of coin tosses until first success (geometric distn)
p <- 0.1; counter <- 0; success <- FALSE
while(!success) {
  success <- as.logical(rbinom(n=1,size=1,prob=p))
  counter <- counter + 1
}
counter
```

```
## [1] 4
```

# break

- break can be used to break out of a for or while loop.

```
for(i in 1:100) {  
  if(i>3) break  
  print(i)  
}
```

```
## [1] 1
```

```
## [1] 2
```

```
## [1] 3
```



Reading from and writing to files

# Native format

- ▶ Use `save()` to save R objects to an “R Data” file.
  - ▶ `save.image()` is short-hand to save all objects in the workspace

```
x <- rnorm(100); y <- list(a=1,x=x)
save(x,y,file="test.RData") # Or .rda, or ...
```

- ▶ Load R Data files into the workspace with `load()`.

```
load("test.RData")
file.remove("test.RData")
```

```
## [1] TRUE
```

## Table format files

- ▶ `read.table()` is the main function for reading tabular data from plain-text files.
  - ▶ `read.csv()` and `read.delim()` are basically `read.table()` with defaults for reading comma- and tab- delimited files.
- ▶ `write.table()`, `write.csv()` and `write.delim()` are the analogous functions for writing tabular data

```
write.table(matrix(1:9,3,3),file="test.txt")
test <- read.table("test.txt")
file.remove("test.txt")
```

```
## [1] TRUE
```

```
test
```

```
##    V1 V2 V3
## 1   1  4  7
## 2   2  5  8
## 3   3  6  9
```

# Reading files from a URL

- ▶ `load()`, `read.table()`, etc. can read data from a URL.

```
baseURL <- "http://people.stat.sfu.ca/~mcneney/Teaching/Stat341/"  
rdURL <- url(paste0(baseURL, "Data/PorschePrice.rda"))  
load(rdURL)  
head(PorschePrice)
```

```
##   Price Age Mileage  
## 1  69.4   3   21.5  
## 2  56.9   3   43.0  
## 3  49.9   2   19.9  
## 4  47.4   4   36.0  
## 5  42.9   4   44.0  
## 6  36.9   6   49.8
```

```
csvURL <- url(paste0(baseURL, "Data/PorschePrice.csv"))  
PorschePrice <- read.csv(csvURL)
```

# Reading more complex text files

- ▶ Defaults for `read.table()` are not always what you want.
  - ▶ In particular, the default for reading columns that include text is to coerce to a factor.
  - ▶ Also replaces spaces in column headers with `..`

```
exURL <- url(paste0(baseURL, "Data/Ex1_1_4.txt"))
ex <- read.table(exURL, header=TRUE, sep="\t")
# same as ex <- read.delim(exURL)
ex
```

```
##   ID Initials Date.of.purchase amount
## 1  3      SEKK      10/23/1995   $5.00
## 2  1      AGKE      08/03/1999  $10.49
## 3  2      SBKE      12/18/2002  $11.00
```

```
str(ex)
```

```
## 'data.frame':    3 obs. of  4 variables:
## $ ID              : int  3 1 2
## $ Initials        : Factor w/ 3 levels "AGKE","SBKE",...: 3 1 2
## $ Date.of.purchase: Factor w/ 3 levels "08/03/1999","10/23/1995",...: 2 1 3
## $ amount          : Factor w/ 3 levels "$10.49","$11.00",...: 3 1 2
```

## stringsAsFactors

- ▶ Reading columns that include characters in as factors is controlled by a global option in your R session called `stringsAsFactors`, set to `TRUE` by default.
- ▶ If you want to set to `FALSE` for an R session type `options(stringsAsFactors = FALSE)` into the Console.
- ▶ An alternative is to over-ride the default in the call to `read.table()`:

```
exURL <- url(paste0(baseUrl,"Data/Ex1_1_4.txt"))
ex2 <- read.table(exURL,header=TRUE,sep="\t",
                  stringsAsFactors=FALSE)
str(ex2)
```

```
## 'data.frame':      3 obs. of  4 variables:
## $ ID           : int  3 1 2
## $ Initials     : chr  "SEKK" "AGKE" "SBKE"
## $ Date.of.purchase: chr  "10/23/1995" "08/03/1999" "12/18/2002"
## $ amount       : chr  "$5.00" "$10.49" "$11.00"
```

## Post-processing: dates

- `Date.of.purchase` should be coerced to a `Date` object.

```
ex2$Date.of.purchase <-  
  as.Date(ex2$Date.of.purchase, "%m/%d/%Y")  
str(ex2)
```

```
## 'data.frame':    3 obs. of  4 variables:  
## $ ID           : int  3 1 2  
## $ Initials     : chr  "SEKK" "AGKE" "SBKE"  
## $ Date.of.purchase: Date, format: "1995-10-23" "1999-08-03"  
## $ amount       : chr  "$5.00" "$10.49" "$11.00"
```

```
diff(ex2$Date.of.purchase)
```

```
## Time differences in days  
## [1] 1380 1233
```

## Post-processing: strings

- ▶ Will probably want to remove the \$ in amount and coerce to numeric.
- ▶ Many options for manipulating strings.
- ▶ For now, just mention substr() and paste() (more on string manipulation in Chapter 2):

```
maxStringLen <- 10 # allows for amounts up to $999999.99
ex2$amount <- as.numeric(
  substr(ex2$amount, start=2, stop=maxStringLen)
)
str(ex2)
```

```
## 'data.frame':      3 obs. of  4 variables:
## $ ID              : int  3 1 2
## $ Initials        : chr  "SEKK" "AGKE" "SBKE"
## $ Date.of.purchase: Date, format: "1995-10-23" "1999-08-03" ...
## $ amount          : num  5 10.5 11
```

```
paste("$", ex2$amount, sep="") # or paste0("$", ex2$amount)
```

```
## [1] "$5"      "$10.49" "$11"
```



# Reading and writing Excel files

- ▶ If you have a working copy of Excel, the easiest approach is to work with `.csv` format and use `read.csv()` and `write.csv()`.
- ▶ However, there are functions in several R packages for reading directly from an Excel file.
  - ▶ See, for example, `read.xls()` from the `gdata` package.